U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 781

# TUBERCULOSIS OF HOGS

TUBERCULOUS CATTLE AND FOWLS are the main sources of tuberculosis in hogs. The disease is conveyed by allowing them to follow tuberculous cattle in the feed lot and feed on the undigested grain in the droppings. It is very significant that tuberculosis is most common among hogs in sections where the disease is also very prevalent among cattle and poultry and where the feeding practices mentioned above are commonly followed. Hogs also contract tuberculosis from feeding on tuberculous carcasses of various animals, including fowls, and on uncooked garbage and slaughterhouse offal.

Prevention lies in allowing hogs to feed behind adult cattle only when the cattle have passed the tuberculin test; also in thoroughly cooking all offal or carcasses before they are fed to hogs. Disposing of tuberculous poultry flocks is also an important preventive measure.

Young steers or young beef animals as a rule do not spread tuberculosis among hogs. Therefore no change need be made in the very profitable practice of allowing hogs to follow feeders and stockers, unless these cattle are not healthy.

When tuberculosis already exists in a drove of hogs all the affected animals on the farm, whether hogs or cattle, should be removed from the premises. The hogs should be sent to market for slaughter at an abattoir under Federal inspection. The tuberculin test should be applied to all cattle on the place, and those reacting should be properly disposed of. The pens and stables should be thoroughly cleaned and disinfected before restocking. Infected poultry flocks should be promptly disposed of according to methods approved by State or Federal authorities and obtainable on request.

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# TUBERCULOSIS OF HOGS

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## PREVALENCE AND ECONOMIC IMPORTANCE OF THE DISEASE

TUBERCULOSIS in the human family has been lessening materially during the last 20 years, and reports from the various meat-packing centers of the country show the same encouraging condition regarding tuberculosis in hogs. Reports from several localities during recent years show a marked decrease in the number of tuberculous swine sent to market, and the country at large shows a decrease also.

The small amount of money required to begin hog raising and the quick returns on the capital invested make this industry attractive to the small farmer. The hog will make a pound of gain on less feed than most livestock, and will profitably utilize waste food products.

Tuberculosis in hogs is closely associated with tuberculosis in cattle and poultry. The reason is apparent when one considers that poultry, cattle, and hogs intermingle freely on most farms in the sections of the United States where tuberculosis is most prevalent in hogs. Tuberculous cattle are responsible for most of the generalized cases of tuberculosis in hogs, while tuberculous poultry are responsible for large numbers of hogs becoming slightly affected. Hogs also contract tuberculosis from uncooked garbage infected with the human strain of the tubercle bacilli. Because of the early age at which hogs are slaughtered, they do not propagate the disease among their own kind to any appreciable extent.

The prevalence of tuberculosis among swine can be judged only from abattoir statistics. Records of the Bureau of Animal Industry show that some sections of the country contribute a far greater proportion of diseased animals than others. Hogs from Arkansas, Oklahoma, and Texas are remarkably free from this disease. They are not confined in feed lots as in the sections where the disease is mostly found, but are allowed to roam over large areas of pasture and to shift for themselves, and when they are found affected the majority show very slight lesions. Furthermore, no prolonged feeding is practiced in narrow bounds, as in the Corn Belt, and there are rela-

[1] Doctor Washburn retired April 25, 1929. Elmer Lash, veterinarian, Tuberculosis Eradication Division, aided in the preparation of this revision.

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tively few dairies or tuberculous cattle in these sections. The hogs are carried from birth to maturity on some form of pasture, as alfalfa, oats, corn, cowpeas, sorghum, rape, and peanuts, all the year round. There can be no doubt that swine fed directly on vegetable feed, such as corn and roughage, are proportionately less affected than those mingling with tuberculous fowls and following diseased cattle.

From bitter experience the hog buyers for packing houses are gradually becoming familiar with these conditions and are avoiding certain regions known to be badly infected. Some packers are taking self-protective measures so as to have the feeder of diseased hogs bear the burden, and many of the smaller establishments in the Central West are buying hogs subject to post-mortem inspection. The tracing of infected shipments is now easily accomplished by tattooing the animals.

It is very probable that many of the farmers who have sold tuberculous hogs have done so without suspecting that they were unsound, for few of these diseased hogs ever show the presence of tuberculosis by outward symptoms. In fact, the hogs that disclose the affection after slaughter are frequently the finest-appearing animals in the drove. If indications of tuberculosis are present before slaughter, they usually consist of marks of general unthriftiness, such as are also present in many other diseases, and therefore do not afford any very definite indication of the presence of tuberculosis. It is therefore important that hog raisers should know the facts about hog tuberculosis and how it may be prevented. The suppression of this disease would save the country many millions of dollars annually.

## METHODS OF INFECTION

The most frequent infection of hogs with tuberculosis occurs, no doubt, through the digestive tract, and in this mode of infection tuberculosis of cattle is very intimately concerned. In those instances in which a marked increase in the number of tuberculous hogs from a certain locality has been noticed and investigated it has too frequently been found that the carcass of some animal that had succumbed to tuberculosis had been thrown to them for final disposal. The certainty with which this condition leads to the infection of the hogs has not heretofore been fully appreciated. Another source of infection for swine exists in the practice of allowing them to run behind tuberculous cattle and feed on the undigested grain in the droppings. The tuberculosis germs discharged with the feces by such cattle may readily infect the hogs.

The question of the infection of hogs from tuberculous poultry has been given more attention in recent years, and it has been demonstrated that, in the principal hog-raising sections of the Middle Western States, infected fowls are a very important factor in swine tuberculosis. Infection of a litter of pigs by a tuberculous sow presents another source of danger. There are a number of other methods of infection which will be mentioned later, but they should be considered of minor importance and must not detract attention from the leading factors in the production of the vast majority of cases of hog tuberculosis, which are unquestionably dead carcasses, infected feed lots, feces of tuberculous cattle, and infected poultry. When

once these conditions are controlled tuberculosis of swine will forthwith be greatly reduced.

### INFECTION THROUGH MILK OF TUBERCULOUS COWS

When the campaign to eradicate tuberculosis in livestock was launched in 1917, the feeding of infected dairy products was one of the chief sources of tuberculosis in hogs. The eradication program has progressed to such a degree of completion, and pasteurization is now so generally practiced at creameries, that this source of infection is of no great importance compared with infected droppings and dead carcasses of cattle and poultry. However, it is interesting to know that numerous experiments conducted by many scientists in various countries agree on the ease with which hogs fed on unpasteurized milk from tuberculous cows may contract tuberculosis. When hogs were fed on tuberculous milk for only 3 days the post-mortem examination held 107 days later showed that 83.3 per cent of the animals had become tuberculous. When hogs received tuberculous milk for 30 days and were allowed to live 50 days longer, 100 per cent of the animals had developed generalized tuberculosis.

That similar experiences occur under natural conditions on the farm has been proved by tracing certain shipments of tuberculous herds to the farms where they were raised and fattened. In one instance a shipment of 74 hogs showed tuberculosis in 61, and investigation brought out the fact that the swine had been fed on the skim milk of a creamery in a near-by town. The separator slime from two of the creameries in this town was obtained for experimental purposes, and the inoculation test showed that one of the samples produced tuberculosis in all the guinea pigs inoculated.

Centrifugal separators have come into general use. In the process of separating the cream from the milk the rapid revolutions of the shaft and disks of the machine deposit at the base of the shaft dirt, hair, manure, and other impurities, and, mingled with this mass, great numbers of bacteria, including at times the germs of tuberculosis.

In one State a lot of hogs which contained 36 per cent of tuberculous animals was traced to the farms of the raiser, and the State authorities were notified. They made a tuberculin test of the cattle that produced the milk, with the result that about 22 per cent of them reacted. This infected milk had been separated on the farm with a hand separator and the skim milk fed to the hogs. It will thus be seen that creameries alone are not at fault, but that the skim milk from the hand separator, if it comes from a tuberculous herd, is equally dangerous. The buttermilk produced at the creamery from the infected separated cream is likewise capable of carrying tuberculosis germs and infecting the animals which consume it.

### INFECTION BY FECES OF CATTLE

A very important source of infection of hogs with tuberculosis is to be found in the feces of tuberculous cattle. It is a very common practice to allow hogs to accompany cattle about the feed lot, and while doing so they thoroughly work the feces over and feed on whatever portions of food have passed undigested through the digestive tracts of the cattle. (See illustration on title page.)

In herds that are healthy this manner of feeding may be commended because of the economy, but if there are tuberculous individuals among the cattle the danger of passing the infection on to the hogs by means of the feces becomes very great.

In a series of investigations by the bureau it was found that the feces of tuberculous cattle are often loaded with the germs of tuberculosis. Tuberculin-tested hogs were placed in isolated pens where a few shovelfuls of such feces were thrown daily while the hogs were fed on other feed which was free from tuberculosis. The result was the infection of 25 per cent of the first lot of hogs and 100 per cent of the second lot that were exposed. The tuberculous condition of the cattle was shown only by the tuberculin test, as they were apparently healthy, having no cough or any visible indications of disease.

A striking instance of probable infection of hogs by cattle feces has been observed. Of 34 hogs which were marketed in one lot 23 were found diseased, and on investigation it was ascertained that the owner had a herd of dairy cows, the stable manure from which was thrown into the hog yard. The hogs were given no milk, nor were they permitted to mingle with the cattle, but were pastured and fed on corn and what they could gather from the cow manure. In fact, the latter form of exposure was the only plausible explanation of infection, and this was later accepted when the tuberculin test of the herd revealed 19 of the 27 cows diseased. This test was confirmed when the cattle were slaughtered and found to be tuberculous, some in an advanced stage.

### INFECTION THROUGH TUBERCULOUS POULTRY

Prior to the inauguration of the systematic campaign for the eradication of tuberculosis from cattle and swine, the problem of avian tuberculosis had been given little study from the viewpoint of control. It had been recognized for many years that avian tuberculosis was transmissible to swine but its rapid spread has been determined only in the last few years.

During 1921 the bureau conducted investigations in northwestern Missouri which conclusively proved that it was necessary to eradicate tuberculosis in poultry in order to produce hogs free from this disease in the Corn Belt section of the United States. In the course of area tuberculosis-eradication work it was also found that in some communities many swine from areas which had been freed of bovine tuberculosis were reported at official abattoirs as being affected with tuberculous lesions. These lesions were of a mild character and not comparable to those caused by bovine infection, and it was particularly noticeable that the complete condemnation of carcasses was, in effect, reduced 100 per cent as compared with the numbers condemned previous to the area work. This led to a more detailed study of the possibility of avian infection in swine. A survey was thereupon made which involved the inspection of about 115,700 flocks of poultry in 40 States. The number of flocks found apparently free was slightly more than 109,010, leaving about 6,690 infected. The estimated number of fowls inspected was 8,108,860. These inspections were made in the course of the routine testing of cattle by regularly employed veterinary inspectors. This survey disclosed the fact that

avian infection lies chiefly in the Middle West and Western States, as far as the Dakotas and Nebraska. A more detailed inspection in this group of States, which includes practically all the Corn Belt, showed an extensive infection in poultry. One county in which an intensive study of the avian problem was conducted, and from which more than 35,000 hogs were shipped after the county was declared to be a tuberculosis-free area, indicated that the principal source of infection in swine was of the avian type. This can better be appreciated when we consider that the lesions of tuberculosis in poultry are most often found in the liver, spleen, and walls of the intestines. The diseased centers being located as they are, millions of tubercle bacilli are constantly being passed in the droppings of a badly infected flock of poultry. When these bacilli are taken into the body of the hog in its feed, infection readily follows. When this condition is recognized or suspected, and the poultry are in association with the swine, owners of such swine should take the necessary steps to obtain prompt and efficient veterinary advice as to the control and eradication of the disease from the poultry and the lessening of the infection in hogs.

### INFECTION THROUGH FEEDING ON TUBERCULOUS CARCASSES OR SLAUGHTERHOUSE OFFAL

It is an all-too-prevalent custom in some sections for hog raisers to buy up all carcasses of animals that have died from various unknown causes and feed them uncooked to their hogs. This is a fertile source of infection with parasites and with any infectious disease that may have caused the death of the animals. Several instances of tuberculous hogs being traced to such exposure have been found.

An equally dangerous source of infection is likewise observed in the methods which prevail at some of the small country slaughterhouses. It is not unusual for these houses to get rid of their blood, intestines, viscera, and other inedible parts by feeding them uncooked to hogs, a herd of which is usually kept on the premises. This custom is dangerous and is another method of spreading various infectious and parasitic diseases, and particularly a disease like tuberculosis. The feeding of offal, etc., to hogs on the premises of abattoirs having Government inspection is not permitted. As the slaughterhouses where hogs are fed in this manner have no Government inspection, this department has no records as to the number that become infected. Such hogs are killed by the butcher on the premises where they are fed, and are marketed as healthy meat.

### TANKAGE DOES NOT PRODUCE TUBERCULOSIS

It has been asserted that the increased use of tankage for hogs was the cause of the increase in the number of tuberculous hogs condemned at the abattoirs. The writers sent out inquiries to State experiment stations where tankage had been fed experimentally to hogs to see whether any case of tuberculosis had developed. Experiments were also carried on by this bureau along the same line. In no case could tuberculosis be shown to have arisen from the consumption of tankage, and it must therefore be freed from all blame in the spread of the disease, and may be regarded as a safe and valuable article of food for use in raising and fattening swine.

Tankage, meat meal, and other animal food products are valuable for supplying the protein in a ration for swine, and have attracted attention from farmers because of the prevailing high prices of other foodstuffs. Tankage, or digester tankage, as it is commonly called, is rich in protein and has proved to be a satisfactory substitute for skim milk as an adjunct to corn. It is made from the trimmings, inedible viscera, and other parts of the carcass, all of which are placed in the tanks and thoroughly cooked under pressure, so that the resulting product comes out sterile. The grease is removed from the surface, and the residue is dried out at a high temperature, then ground, screened, and placed in 100-pound bags.

### INFECTION FROM FEEDING UNCOOKED GARBAGE[2]

The feeding of uncooked city garbage to hogs is undoubtedly a factor in the development of disease. Although there are no broad statistics obtainable concerning the prevalence of tuberculosis among garbage-fed hogs, there are records showing that animals fed on such material contract diseases far more frequently than when swine are fed on cooked garbage or other ordinary feeds. The most frequent sources of infection in garbage are sputum from tuberculous people, and the offal of tuberculous poultry.

At an establishment near Jersey City about 2,000 hogs are raised each season entirely on garbage from hotels of New York City. They are fed on cooked garbage exclusively, with the exception of a partial diet of dry or stale bread for a certain period before slaughter. In addition to the hogs thus raised and fed on the premises the firm slaughters a comparatively large number of hogs purchased from outside sources, either in odd lots from neighboring farmers or in car lots from shipping centers. These hogs do not come in contact with the hogs fed on the premises. When examined after slaughter they are found to be affected with tuberculosis in about the same proportion as is shown by the average of hogs inspected elsewhere. On the other hand, among the hogs raised exclusively on sterilized garbage no indication of tuberculosis has been found when they were inspected at the time of slaughter.

The same firm has been engaged in this business for several years, and its members state that after feeding the cooked garbage for some time they noticed a remarkable freedom from disease in the animals thus fed as compared with animals obtained from outside sources. Originally their main object in cooking the garbage was the recovery of the valuable grease obtained.

### INFECTION BY TUBERCULOUS ATTENDANTS, BROOD SOWS, ETC.

The fact has been well established that hogs may contract tuberculosis by eating the sputum of consumptives. Proper precautions in selecting caretakers for farm animals will prevent the occasional infections from this source. Frequently a large percentage of the hogs in lots fed on uncooked garbage from tuberculosis sanitariums, poor houses, and insane hospitals show lesions of tuberculosis when slaughtered.

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[2] The cooking of garbage sometimes has certain disadvantages from the feeding standpoint, as pointed out in Farmers' Bulletin 1133, Feeding Garbage to Hogs.

Tuberculosis may be transmitted from hog to hog, especially from a tuberculous brood sow to her pigs, but this manner of infection is rather infrequent compared with the number of cases that can be traced to tuberculous cattle or poultry.

## SYMPTOMS OF TUBERCULOSIS IN HOGS

If the disease has progressed to an advanced stage, various symptoms may appear. Intestinal tuberculosis is frequently accompanied by general disturbance of the digestive functions, and constipation or diarrhea may be shown. Advanced tuberculosis of the lungs is shown by a persistent, dry, harsh cough, and by rapid breathing, especially on exercise. This cough is similar to that caused by lungworms and can not be distinguished from it.

Interference with both respiratory and digestive functions may be seen when the disease is widely generalized, and the numerous alterations are shown by progressive emaciation and weakness. Localized centers of the disease in bones or joints may produce lameness and other visible indications, but they are comparatively very rare.

In most cases no intimation of the presence of the disease is given until the animal is slaughtered, and the discovery of one or more tuberculous hogs in a drove of apparently prime, well-finished animals is often the cause of great surprise and disappointment to their owner. In such cases the lesions may be sufficient to prove the disease to be far advanced and the germs to be so widely distributed as to render the meat unfit for food.

## THE TUBERCULIN TEST

In those cases in which the disease is not characterized by prominent symptoms, and yet the animals are suspected of having the disease, the tuberculin test is recommended. This makes it possible to slaughter the reacting animals in the early stages of the disease and thus get rid of the infection. This test is especially important in holding over brood sows, as experiments have indicated that the milk of these sows may infect the young pigs.

The intradermic method of applying the tuberculin test has been tried on hogs and has given excellent results. If the animal is not affected, no change in the appearance of the ear will result, but a positive reaction will at the end of 48 hours cause a swelling near the seat of injection, as shown in Figure 1. This enlargement may remain visible for 10 or 12 days after the injection in case the animal is affected with tuberculosis. If it is suspected that infection with tuberculosis may be present in the swine, the tuberculin test should be applied by a qualified veterinarian.

## LESIONS

The vitality of hogs or their powers of resistance to disease are necessarily lowered by the unnatural conditions frequently found in hog raising, namely, the forced feeding for fattening and the small feeding pens in vogue in certain districts. When the enormous growth of a hog is considered, when it is realized that in the short space of 8 to 10 months its development is frequently 250 to 300

pounds—a proportionate increase of weight unknown to any other species of domestic animals—the great changes which must necessarily occur can be appreciated. Such rapid development is very liable to take place at the expense of the disease-resisting powers of the animal.

When tuberculosis results the lesions usually observed are distinct and of a chronic type, as manifested by limelike deposits and fibrous walls. It is not infrequent, however, that a more extensive and spreading disease is seen, and lesions indicate a severe infection and rapid diffusion of the germs or bacilli, which in these animals may quickly follow the initial attack. And whether the disease assumes an acute, subacute, or chronic type, tuberculous growths may soon be found attacking lymph glands in widely separated parts of the body.

As a general rule, the lymph glands become enlarged and a cheeselike change occurs at several points where the tubercles had started,

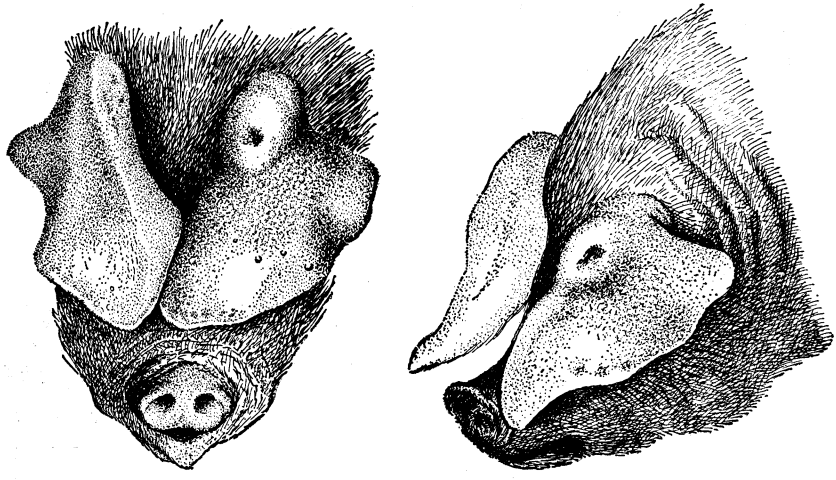

FIGURE 1.—Tuberculin test for hogs, intradermic method, showing enlargement at seat of inoculation, due to positive reaction. (After Moussu)

causing numerous small, yellowish areas often surrounded by a reddened, inflamed zone. These areas are composed of broken-down gland substance, and are sometimes intermingled with pus; at other times they are of a cheesy consistency, and more frequently gritty through the deposit of limelike particles.

As the disease is produced essentially by feeding, the glands and tissues associated with the digestive tract are the most frequent seats of infection. Indeed, the throat glands (in almost all cases the submaxillary gland) are nearly always affected, as at the post-mortem examinations held by bureau inspectors during a consecutive period on 120,000 tuberculous hog carcasses, 93.3 per cent were found to contain lesions in these glands. Next in importance are the bronchial glands, of which 27.2 per cent were diseased, while the chain of liver glands was involved in 21.6 per cent of the cases. In all these cases the lesions may involve the entire lymph structure, or only the central or several irregular points, and may be either cheeselike, lime-

FIGURE 2.—Tuberculosis of hog, involving the lungs, liver, spleen, and intestines

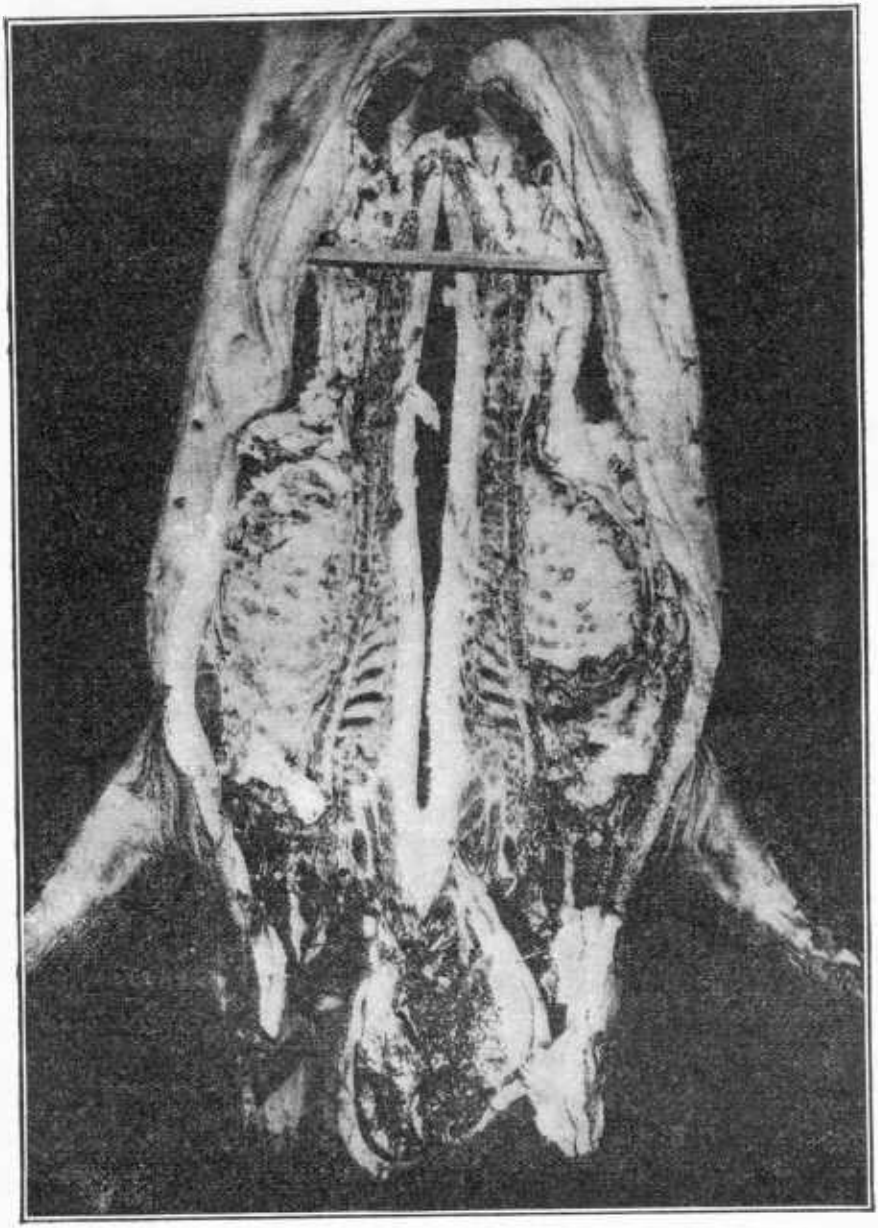

FIGURE 3.—Tuberculous hog carcass, showing tuberculous nodules on the ribs

like, or both. The intestinal lymph glands showed lesions in 18.1 per cent of the carcasses examined.

The liver was affected in 9.2 per cent of the cases and showed either yellowish points, which were cheesy and scattered, not only on the surface but also within the organ, or the larger, irregular nodules, varying from a hempseed to a hickory nut in size. They are at times quite fibrous in consistency and may contain a cheesy center, or limelike deposits may occur as the disease advances and the lesions become more considerable. The lungs are the next tissue to be most frequently affected, as is represented by 7 per cent of the carcasses above recorded. There may be tuberculous pneumonia involving large areas of the lungs, causing collapse of the borders. There may be irregular-sized grayish or yellowish areas, as is so often seen in cattle; but not infrequently large numbers of shotlike areas, showing evidence of general disease, are observed.

The spleen showed lesions in 3.8 per cent of the carcasses mentioned above. The spleen is usually darker in color and the surface is rough and nodular, depending on the number and size of the tubercles. Unlike the spleen of a tuberculous cow, these nodules do not often occur on the outside membrane. They vary from the size of a half pea to as large as a hickory nut. The external pale or light-red nodules are raised above the surface of the organ and frequently show fibrous tissue bands radiating from the center.

Occasionally lesions similar to those found in other glands are noted in the mediastinal and sublumbar glands. In occasional cases the membranes lining the body cavities may show an eruption of tuberculous nodules. The generative organs are rarely affected. The bones are sometimes attacked. Tuberculosis of the muscles has been noted, but not so frequently as of the bones and joints. These lesions are usually rather limited to one region. The extreme rarity of lesions in the kidney is shown by the finding of but 3 cases in the 120,000 tuberculous carcasses.

Occasionally also ulcers and tuberculous nodules are noticed on the lining of the small intestines, especially of young pigs, but likewise are rare, and when found usually accompany numerous lesions elsewhere in the body.

## PREVENTIVE MEASURES

### REMOVAL OF AFFECTED ANIMALS

The first step to be taken in preventing the further spread of tuberculosis is to remove all affected animals, whether hogs, cattle, or fowls, from the premises, as they will only serve as sources of infection so long as they are allowed to mingle with healthy animals. In dealing with affected herds of cattle it has been found best in most cases to apply the tuberculin test to the entire herd as a means of selecting the tuberculous animals, but in the case of a drove of hogs in which tuberculosis has spread there can be no doubt that the best and surest method of procedure, in nearly every case, is to slaughter the entire drove as soon as the animals can be put in a marketable condition. They should be slaughtered at an abattoir under Federal inspection, so that proper disposal of affected carcasses may be made. A farm may be stocked rapidly with healthy

swine after the total slaughter of a tuberculous lot. The early age at which the sow may be bred, her capacity for breeding twice a year, and the plural number of her offspring are forceful arguments for the total destruction of every diseased drove of hogs and the breeding up in clean, healthy quarters of a sound, healthy drove in its stead.

As tuberculosis seldom attacks the hogs of a farm except through tuberculous cattle or fowls, the tuberculin test should be applied to all the cattle on the place, and all tuberculous animals among them should be isolated or destroyed at the time of disposing of the hogs. The fowls, if diseased, should be disposed of by burning.

In case the disease has only recently been introduced among the hogs it is advisable to apply the tuberculin test to them so that the affection may be detected in the early stages. By slaughtering only the reacting hogs and saving the healthy ones the hog raiser may clean up his herd with as little loss as possible.

### DISINFECTION

With all the hogs removed from the place and no tuberculous cattle or poultry remaining, attention should next be given to disinfecting the premises, so that no center of infection may be left to contaminate future purchases of livestock. The disinfection of pens, stables, and poultry houses may be accomplished by thoroughly cleaning them, scrubbing the floors with hot water, brushing down all loose dust from the walls, and tearing out all decayed or partly decayed woodwork. The interior of the pens or stables should then be carefully covered with a coating of limewash containing 4 or 5 ounces of compound solution of cresol (U. S. P.) to each gallon of the limewash.[3] The yards should be carefully cleaned at the same time, especial attention being given to the removal of all rubbish and litter from the dark, shady corners. Lime, or a 3 per cent solution of carbolic acid, may then be sprinkled on these dark portions of the yards. In all the open portions of the yard the action of the direct rays of the sun very quickly destroys the life of the scattered tuberculosis germs.

The premises now being cleaned, healthy foundation stock may be procured, and if proper attention is given to keeping the cattle and poultry free from tuberculosis and to supplying the hogs with suitable food, the owner may feel every reasonable assurance that he has seen the last of tuberculosis among his swine. The trouble, time, and expense required will be more than repaid by the advantage gained.

Tuberculosis can not develop spontaneously in swine but must be acquired from some outside source, and the farmer whose yards and stables have been thoroughly freed from the disease need fear no reappearance of the disease, except when introduced from some outside point of infection.

### PASTEURIZATION OF ALL MILK PRODUCTS USED FOR FEED

The heating of all milk, when received at public creameries, to 145° F. for 30 minutes or to 176° for a moment will be found most effective in preventing the spread of tuberculosis to the animals con-

[3] More detailed information is given in Farmers' Bulletin 926, Some Common Disinfectants, and Farmers' Bulletin 954, The Disinfection of Stables, issued by the United States Department of Agriculture.

suming the by-products of such creameries. Denmark was one of the pioneers in this movement, having in 1898 passed a law requiring all skim milk and all buttermilk to be warmed to 185° before it could be distributed from any creamery to its patrons for feeding purposes. It was found, however, that this degree of heat was harmful to the product, and in 1904 the required temperature was reduced to 176°, experiments having proved that no tuberculosis germs could withstand that degree of heat. In practically all the Danish creameries since the latter date the whole milk has been heated to the required point, thus assuring butter that is free from tuberculosis germs, as well as by-products that are safe for use in feeding hogs or calves. The result of these regulations has been most satisfactory. The spread of tuberculosis to farms previously free, through the skim milk or the buttermilk from creameries, has been very markedly checked and suppression of the disease in hogs has been plainly noticeable.

Treating creamery milk as a cause of the spread of tuberculosis among hogs, Moussu, a French investigator, makes the statement that cooking the by-products of creameries and cheese factories results in the disappearance of tuberculosis of an intestinal origin among the hogs fed with them, and the hog owners no longer fear losses from this disease.

### FINDING AND REMOVING CENTERS OF INFECTION

The Bureau of Animal Industry is endeavoring to find infected farms, or at least infected localities, and to ascertain the direct cause of the spread of the disease in these districts. Owing to the number of hands through which hogs go before reaching the abattoirs this is not easy, but it can be and is being accomplished. Already, through cooperation with the State authorities, a large number of infected farms have been definitely discovered. The conditions on these farms have been investigated, the source of the disease determined, and methods for its suppression recommended. Both the bureau and State officials have been working with these ends in view. When hogs slaughtered under Federal meat inspection have been found to be tuberculous and the farm from which they came has been identified, the State veterinarian is notified. In most States this officer is empowered by law to quarantine any farm when he suspects the presence of a contagious disease thereon. He then applies the tuberculin test to the cattle on the farm and otherwise looks for the source of infection, which frequently results in finding that the cattle or poultry are tuberculous.

This cooperation with the State is of great value, and the results would be greater if State legislation were enacted to compel the tagging or tattooing of all hogs going to slaughter, so that the animals if tuberculous could be immediately traced to their point of origin and the source of infection removed.

### SPREADING INFORMATION AMONG FARMERS AND DAIRYMEN

While pamphlets, popular articles, and public notices would be extremely useful in eradicating tuberculosis in swine, it would probably be more satisfactory to explain to the hog raiser, by word of

mouth, the methods to be followed. The veterinarian is the best-equipped man available for the work. The State might also assist by employing veterinarians to give public lectures in towns and townships, as is done at present in Sweden. There is now absolute knowledge that the vast majority of cases of hog tuberculosis are produced by—

1. Feeding behind tuberculous cattle.
2. Feeding tuberculous carcasses of various animals, including fowls or feed contaminated by tuberculous fowls.
3. Feeding slaughterhouse offal.
4. Feeding uncooked garbage.
5. Feeding raw milk from tuberculous cows.

It therefore behooves veterinarians to educate their clients as to the proper method of preventing the disease, as they would recommend a proper feeding ration or proper construction of a stable. Hog raisers should: (1) Let the hogs feed behind healthy cattle only, or those which have passed the tuberculin test; (2) feed carcasses of animals that have died from any cause, or offal from the slaughterhouse, only after the meat or offal has been thoroughly cooked; (3) keep healthy poultry only; and (4) boil milk before feeding, if from untested cows.

A system of tattoo markings, which remain on the dressed carcass, has greatly aided in determining the origin and ownership of such animals. This method of tattooing hogs may be used at the farm or shipping point and is fully described in Miscellaneous Circular No. 57, the Tattoo Method of Marking Hogs and Its Use, published by the department. The eradication of swine tuberculosis on any farm is practicable, relatively easy, and should be undertaken without delay before the disease has gained too much headway.

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